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JANUARY 6, 1986

CHEMICAL & ENGINEERING

NEWS

U.S. chemical industry is taking steps to avoid Bhopal-type accidents
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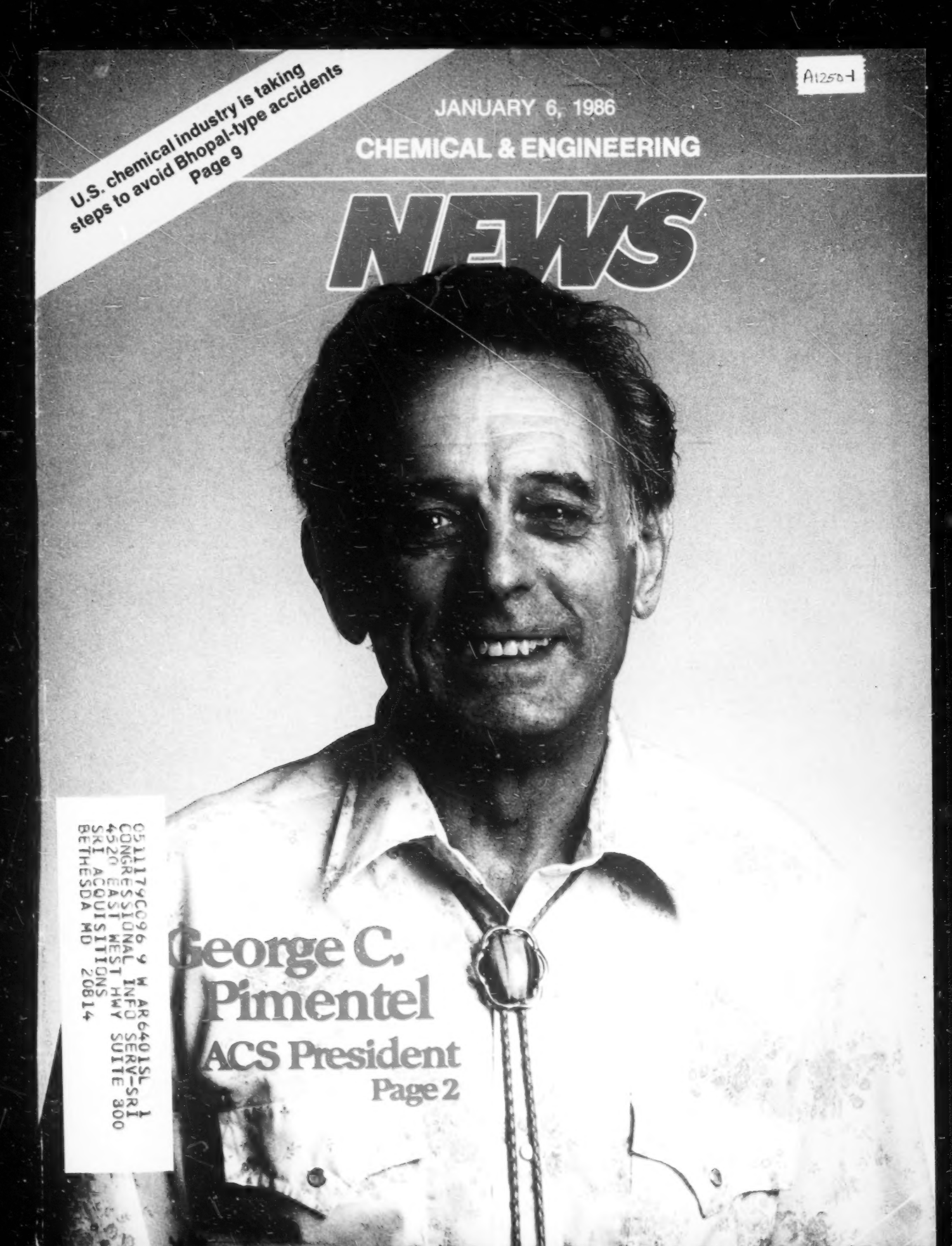

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ACS President
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■ **Indian government releases its report on events leading to Bhopal disaster.** **Page 6**

■ **Union Carbide to sell its consumer products businesses as well as other assets.** **Page 7**

■ **Advances in containerless processing, measuring compounds in the atmosphere among those still being realized from Spacelab 3 mission.** **Page 7**

■ **Keith McKennon named R&D director at Dow Chemical.** **Page 8**

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Use of ethanol to raise octane levels of gasoline may become more economically attractive as lead limit drops. **Page 18**

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EPA's plan to help communities prevent chemical disasters will test voluntary cooperation between industry and local officials. **Page 20**

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Cleanup of pollution in Great Lakes fraught with complexities; cutting industrial discharges has not had desired effect. **Page 24**

Photomicrograph of heterogeneous mixture of sulfur and ketone takes first prize in Polaroid's annual competition. **Page 25**

Books

"Comet Halley: Once in a Lifetime" by Mark Littmann and Donald K. Yeomans is a comprehensive study of the famous comet. **Page 26**

Cover: Photo by Greg Pease

News Focus

U.S. chemical industry is taking steps to avert any more Bhopals by bolstering response programs, better informing the public, and developing safer processes. **Page 9**

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Great Lakes Cleanup More Complex than Anticipated

Cutting industrial discharges has had little effect on pollution; emissions into air and groundwater play big role and their control is difficult

The complexities of ecosystems and pollution pathways are hamstringing environmental scientists trying to cleanse the Great Lakes of toxic chemicals.

Considerable progress has been made in recent years in throttling the flow of industrial wastes into these interlocking inland lakes. But scientists are surprised and disappointed at how little this has improved the pollution picture: Residents of the Great Lakes region, they say, still are exposed to "appreciably more" toxic chemicals through contaminated drinking water and food products than other North Americans. This assessment came to light last month after a joint committee of the U.S. National Research Council and the Royal Society of Canada completed a broad review of the Great Lakes Water Quality Agreement between the two nations (C&EN, Dec. 16, 1985, page 13).

The committee noted that "major progress" has been achieved in reducing levels of phosphates and several other pollutants in the Great Lakes. But it also said that further reductions in pollutant levels are urgently needed to reduce the health risks of people using the resources of the basin.

Scientists now realize that "simply going after industrial discharges is not enough," says environmental researcher Orie L. Loucks of Butler University. "The picture is more complex."

Indeed, the pollution of the Great Lakes ecosystem is fed by several different sources. Two of these—groundwater and atmospheric deposition—have turned out to be more important than originally thought. For example, the committee pointed out that more than 80% of the polychlorinated biphenyls (PCBs) in Lake Superior fall from the skies.

Thus, it's quite understandable why reducing industrial discharges has had such a meager effect: Such wastes, Loucks says, are "an awfully small part of the picture." And controlling emissions into groundwater and air is a far more difficult undertaking.

Loucks, who heads Holcomb Research Institute at Butler University, served as one of the cochairmen of the binational study committee, along with environmental scientist Henry A. Regier of the University of Toronto. The main purpose of the committee was to assess whether the Great Lakes Water Quality Agreement is still adequate. The agreement, first signed by the U.S. and Canada in 1972 and strengthened in 1978, spells out objectives for improving the quality of Great Lakes water. It also authorizes several cooperative programs and coordinating groups for achieving these goals.

The 1978 revision of the agreement strongly emphasized reducing the levels of toxic chemicals such as DDT and PCBs. When those pollutants came under more strict controls in the 1970s, Loucks says, there was a "certain amount of immediate impact." Nevertheless, the concentrations of those compounds in the food chain have remained relatively constant or declined only slightly since 1978, according to studies cited by the committee.

Lake Ontario is most polluted of Great Lakes

Monitoring programs in both the U.S. and Canada have shown that individual fish caught in the Great Lakes regularly exceed allowable levels of toxic residues. Although toxic contamination of other foods produced in the Great Lakes region is less well documented, PCB levels in Canadian beef have been shown to be much higher in Ontario and Quebec than in the Atlantic or western provinces.

Of particular concern to the committee is a Wisconsin study showing that infants nursing on PCB-contaminated breast milk are receiving daily doses of the toxic chemicals in excess of the maximum allowable levels set for adults by the U.S. Food & Drug Administration.

Although the immediate health effects, if any, of such exposures are unclear, the committee expressed strong concern about the possible long-term effects of exposure to and accumulation of toxic compounds. In the case of infants' exposure to PCBs, the committee called for long-term epidemiological studies to assess possible increased cancer risks or other health effects.

The picture of Great Lakes pollution isn't painted entirely in blacks and grays, though. The committee notes that major progress has been made in reducing phosphate levels in the lakes. "Those waters that were severely enriched [in phosphates] are showing signs of recovery," it says. Also evident are lower levels of heavy-metal ions, some persistent pesticides, and some industrial organic chemicals from point sources.

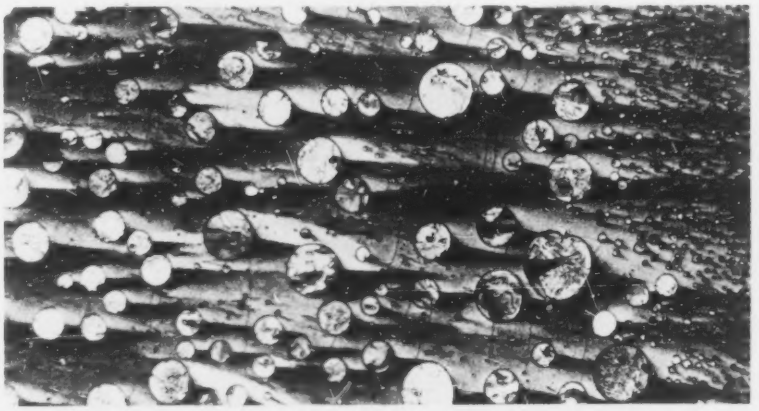
Even though phosphate levels have been driven down, many species of aquatic life in the lakes "remain stressed," the committee found, and further reductions are necessary. Phosphate pollution caused by municipal sewage and by use of fertilizers, detergents, and other products can lead to the proliferation of algae and other plants because phosphorus is a basic plant nutrient. Overabundance of algae, in turn, can deplete oxygen in the lake water, leading to stress and consequent loss of certain species of fish.

Most of the progress so far in limiting the introduction of phosphates into the lakes has come through improved control of point sources, especially municipal sewage facilities. "Increased investment in municipal sewage-treatment plants," the committee says, "is the major success story of the phosphorus control programs of the 1972 and 1978 agreements."

Nevertheless, the committee points out that relatively few concrete corrective measures have been implemented to reduce other types of toxic pollution in the Great Lakes. It calls on the states and provinces bordering the lakes and on the two federal governments to face the challenge by developing a comprehensive strategy for managing toxic substances. Such a strategy, it notes, should include an inventory of all sources of toxic chemicals of concern within the Great Lakes ecosystem, actions to prevent leaking of toxic compounds from landfills, and better management of toxic waste through siting and operation of modern treatment centers in all regions of the basin.

To improve accountability in carrying out the water quality agreement, the committee suggests that the U.S. and Canadian governments issue a report every two years on progress achieved and that bilateral meetings be held regularly among senior officials to discuss any problems.

Also urgently needed, according to the committee, is continuity in the planning and funding of interdisciplinary research initiatives aimed at gaining a better understanding of the Great Lakes ecosystem and the connections between chemical contamination, water-level fluctuations, economic development, and fisheries management. □



Sulfur/ketone photomicrograph wins first prize

This photomicrograph of a heterogeneous mixture of sulfur and ketone, magnified 26 times, recently won first prize in the black-and-white light microscopy category at Polaroid Corp.'s fourth annual International Instant Photomicrography Competition. The photograph was taken by William E. Schadel of Raleigh, N.C., using a Nikon polarizing microscope and Nikon 35-mm camera. Winners also were selected in three other categories—electron microscopy, color light microscopy, and photographs taken with instant color slide film. All the first-prize winners received printing systems for making prints from 35-mm slides or $1500 cash awards. Some 400 images were entered in the competition by scientists, engineers, and amateur photomicrographers from seven countries.

Most PCBs in Lake Superior come from atmosphere

Source	Kg per year	% of total
Atmosphere	6600–8300	82–86%
Tributary	1300	13–16
Municipal discharges	66	1
Industrial discharges	2	1
Total	8000–9000	

Source: Steven J. Eisenreich, University of Minnesota, Minneapolis.